IEC TR 61850-90-20

Edition 1.0 2025-08

TECHNICAL REPORT

Communication networks and systems for power utility automation - Part 90-20: Use cases of redundancy in systems

ICS 33.200

ISBN 978-2-8327-0614-5

IEC TR 61850-90-20:2025-08(en)

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CONTENTS

FOREWORD 3
INTRODUCTION 5
1 Scope 7
2 Normative references 7
3 Terms and definitions 7
4 Abbreviations 8
5 Introduction to redundancy concepts 8
5.1 General 8
5.2 Standby redundancy 9
5.2.1 General 9
5.2.2 Cold standby redundancy 9
5.2.3 Warm standby redundancy 10
5.2.4 Hot standby redundancy 10
5.2.5 1:N redundancy 11
5.3 Active-active redundancy 11
5.3.1 Active-active (hot-hot) redundancy 11
5.3.2 Active-active redundancy with load balancing 12
5.4 Modular redundancy 13
5.4.1 General 13
5.4.2 Dual modular redundancy 13
5.4.3 Triple modular redundancy 13
5.5 Partial redundancy 14
6 Use cases 14
6.1 General 14
6.1.1 Overview 14
6.1.2 Client redundancy 15
6.1.3 Server redundancy 15
6.1.4 Actors 15
6.1.5 State machine 15
6.2 Use case 1: Startup of redundant clients 16
6.2.1 Overview 16
6.2.2 Use case description 17
6.3 Use case 2: State change of redundant clients 18
6.3.1 Overview 18
6.3.2 Use case description 18
6.4 Use case 3: Redundant reporting 20
6.4.1 Overview 20
6.4.2 Use case description 20
6.5 Use case 4: Startup of redundant servers 22
6.5.1 Overview 22
6.5.2 Use case description 22
6.6 Use case 5: State change of redundant servers 23
6.6.1 Overview 23
6.6.2 Use case description 23
6.7 Service on demand use cases 24
6.7.1 Overview 24

6.7.2 Use case 6: Redundant clients perform service on demand on single server 25
6.7.3 Use case 7: Single client performs service on demand on redundant servers 26
6.7.4 Use case 8: Redundant clients perform service on demand on redundant servers 28
Bibliography 30

Figure 1 – Basic redundancy scheme, Redundant Client 5
Figure 2 – Basic redundancy scheme, Redundant server 5
Figure 3 – Cold standby redundancy 10
Figure 4 – Warm standby redundancy 10
Figure 5 – Hot standby redundancy 11
Figure 6 – 1:N redundancy 11
Figure 7 – Active – Active redundancy 12
Figure 8 – Active-aActive redundancy with load balancing 12
Figure 9 – Dual modular redundancy 13
Figure 10 – Triple modular redundancy 14
Figure 11 – Simplified state diagram for Initialization and change of state for one IED 16
Figure 12 – Collaboration diagram for use case 1 – Startup of redundant clients 16
Figure 13 – Collaboration diagram for use case 2 – State change of redundant clients 18
Figure 14 – Collaboration diagram for use case 3 – Redundant reporting 20
Figure 15 – Collaboration diagram for use case 4 – Startup of redundant servers 22
Figure 16 – Collaboration diagram for use case 5 – State change of redundant servers 23
Figure 17 – Collaboration diagram for use case 6 – Service on demand from redundant clients on single server 25
Figure 18 – Collaboration diagram for use case 7 – Service on demand from single client on redundant servers 27
Figure 19 – Collaboration diagram for use case 8 – Service on demand from redundant clients to redundant servers 28

Table 1 – Actors 15

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Communication networks and systems for power utility automation - Part 90-20: Use cases of redundancy in systems

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The text of this Technical Report is based on the following documents:

Draft	Report on voting
57/2786/DTR	57/2817/RVDTR

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Report is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

INTRODUCTION

Parts of this document are based on IEC TR 61850-90-2, *Communication networks and systems for power utility automation – Part 90-2: Using IEC 61850 for communication between substations and control centres*.

Redundancy is used to increase the availability of a system. This document describes different types of redundancy (denoted as redundancy schemes), while focusing on device redundancy.

Put into simple words, device redundancy is using two physically different devices for the same purpose. If one of them fails, the other one takes over. The failover time of the affected components, which results in a downtime of this part of the system, is as little as possible. In this way, continuous operation is ensured. Loss of data can be avoided.

Since redundant devices provide equal functionality at the same time, information flow to and from these devices is often duplicated. Therefore, components of a redundant system are able to handle duplicated data.

Figure 1 and Figure 2 describe two basic redundancies. The first one shows redundant clients, the second one shows redundant servers. Blue lines indicate dataflow, the green dotted lines indicate an option for shared data between the two redundant components. In the first example a server in IED A has two redundant clients, one in each of IED G and H. In the second example, a client in IED H has two redundant servers, IED A and IED B.

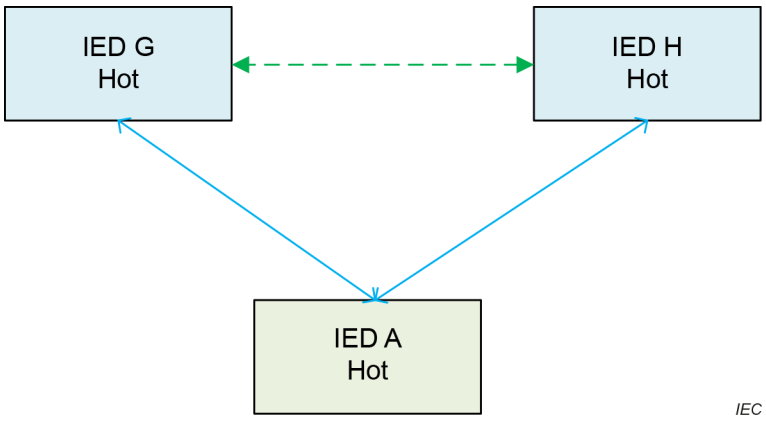


Figure 1 – Basic redundancy scheme, Redundant Client

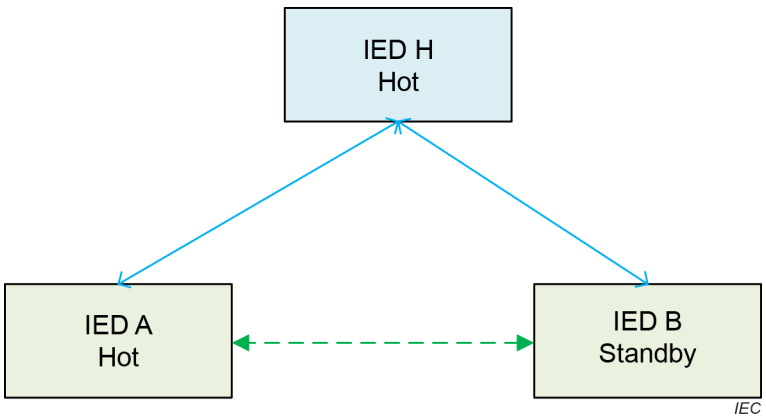


Figure 2 – Basic redundancy scheme, Redundant server

For the communication between the redundant system application and the lower level IEDs typically IEC 61850 is used, mainly based on IEC 61850-8-1(MMS) reporting and commands, for time critical functions with IEC 61850-8-1(GOOSE) and IEC 61850-9-2(SV).

For the communication with clients at station level typically IEC 61850 based on MMS is also used for supervision, commands, and configuration changes. Since MMS is an acknowledged service, server and client are aware of each other and the client supervises the servers.

To enable changes of settings or configuration data without having contradicting behaviour, the higher-level client must be able to switch the standby IED entity to off, thus invalidating all application related output data for any possible receivers.

Since GOOSE and SV are unacknowledged services, the sender does not need to be aware of any receivers. The receivers are only aware of the message (application) addresses, and not of the physical senders, a separate supervision of the physical senders might be necessary.

Setting the application mode of the active IED entity to off could be one possibility to force a switchover to the standby unit. This especially means that the deactivated entity does no longer send GOOSE and SV messages. Other methods for triggering a switchover are discussed in this document.

In this document several use cases are elaborated and presented to serve as input to a future edition of this document to extend initialization and synchronization requirements based on these use cases.

1 Scope

This part of IEC 61850, which is a technical report, describes use cases of redundancy in systems.

This document considers use cases of duplication of function and devices and covers redundancy of information flow at message level. Functional safety is out of scope of this document. To keep focus on details relevant for this document, some figures and drawings do not show electrical wiring, redundant coils, etc, where this is not important for the use case.

This document is not a guideline on the design of redundancy systems; guidance on designing redundancy systems can be found in textbooks such as [1][1] and [2].

2 Normative references

There are no normative references in this document.

[1] Numbers in square brackets refer to the Bibliography.